W. D. MacMillan: "An existence theorem for periodic solutions."

W. F. Osgood: "A condition that a function in a projective space be rational."

J. C. Fields: "A method of proving certain theorems relating to rational functions which are adjoint to an algebraic equation for a given value of the independent variable."

M. B. White: "The dependence of focal points upon curvature for problems of the calculus of variations in space."

J. E. Hodgson: "Orthocentric properties of the plane directed n-line."

S. E. Urner: "Certain singularities of point transformations in space of three dimensions."

J. R. Conner: "Multiple correspondences determined by the rational plane quintic curve."

THE March number (volume 18, number 6) of the *Bulletin of the American Mathematical Society* contains: Report of the winter meeting of the Chicago Section, by H. E. Slaught; "An identical transformation of the elliptic element in the Weierstrass form," by F. H. Safford; "Surfaces in hyperspace which have a tangent line with three-point contact passing through each point," by C. L. E. Moore; "Note on mixed linear integral equations," by W. A. Hurwitz; "Note on the graphical solutions of the fundamental equations in the short methods of determining orbits," by A. O. Leuschner and B. A. Bernstein; "On a functional equation," by A. R. Schweitzer; "Shop mathematics," by C. F. Warner with rejoinder by C. N. Haskins; "Shorter Notices": Dumont's Arithmétique générale, by N. J. Lennes; Schur's Grundlagen der Geometrie, by F. W. Owens; Appell and Dautheville's Introduction à l'Etude de la Physique et de la Mécanique appliquée, by J. B. Shaw; Crelier's Systèmes cinématiques, by Arnold Emch; "Notes"; "New Publications."

THE April number of the *Bulletin* contains: Report of the February meeting of the society, by F. N. Cole; "On the foundations of the theory of linear integral equations," by E. H. Moore; "Shorter Notices": Young's Fundamental Concepts of Algebra and Geometry, by E. B. Lytle; Friedel's Leçons de Cristallographie, by J. B. Shaw; Andoyer's Nouvelles Tables trigonométriques fondamentales, by E. W. Brown; Annuaire du Bureau des Longitudes pour l'An 1912, by E. W. Brown; "Notes"; "New Publications."

SPECIAL ARTICLES

TERTIARY DEPOSITS OF EASTERN MEXICO

OUR investigations during the past year on the eastern coast of Mexico have brought out very important facts in connection with the historical geology of the Gulf Coast.

As stated in this journal a year ago,[1] deposits which are lithologically and faunally the same as those referred to the Eocene in the Texas Coastal Plain were traced southward through northeastern Mexico to the Conchos or Presas river. Fossils characteristic of substages of the Texas Claiborne were found on this river, and beyond it the sediments were traced southward to a point a few miles north of Abasola, where they passed from sight beneath the overlap of the San Fernando Oligocene. The materials of the Eocene throughout this region are clays and sands in all respects similar to those of the Texas area and the fossils are species practically identical with those of that region.

The materials of the Oligocene are yellow clays and sands with thin beds of impure limestone, carrying an abundant fauna. These beds are not represented at all in the Texas area between the Brazos and Rio Grande. If they were ever present they have been eroded or concealed by the overlap of later beds.

From the point north of Abasola, where the San Fernando is found resting upon the Papagallos shales of the Cretaceous, this contact continues southward along the eastern border of the valley of the Soto la Marina river to the town of the same name; then it parallels the eastern flank of the Tamaulipas range, drawing gradually nearer the Gulf shore until, in the vicinity of Tordo bay, the Cretaceous is found within 8 miles of the coast.

[1] SCIENCE, Vol. XXXIII., No. 841, pp. 232–234.

No deposits in any way similar to those of the Eocene of this northeastern region have so far been observed south of Abasola, which is 120 miles north of Tampico. The last characteristic Gulf Coast Eocene fossils were found on the Presas river 160 miles north of Tampico.

In the region to the south and west of Tampico an entirely different condition exists. The Papagallos shale continues along the western border of the lowland and also occurs as inliers in the later formations. It is a compact blue shale, more or less calcareous, and up to the present we have found no fossils in it.

It is succeeded by a shale so similar in color and general structure as to make a separation extremely difficult, unless one is fortunate enough to find the fossils which occur here and there in it. One such locality is that on the Buenavista River near Alazan, some 25 miles northwest of Tuxpam and 75 miles south of Tampico. A collection of fossils made at this point by Professor Cummins shows a fauna consisting principally of small gasteropods with a few bivalves, many of which are very similar to, and some identical with, those of the Tejon beds of the Pacific coast. More detailed examinations will doubtless result in recognizing these beds at many other localities, since they unquestionably underlie a large area. They may even extend northward through the valley in which the Tampico and Monterey railroad runs, since we found similar fossils in a well at Topila at a depth of 1,810 feet. From this locality we have the following forms as determined by Mr. G. C. Gester:

1. *Dentalium stramineum* Gabb.
2. *Surcula monolifera.*
3. *Turris* n. sp. (near but not *Claytonensis*).
4. *Olivella near-mathewsonii.*
5. *Corbula* (species not determined but identical with a specimen from Marysville Buttes Tejon).
6. *Tritonium* (*Murex*) n. sp. (identical with material from Marysville Buttes Tejon).
7. *Conus remondii.*
8. *Neverita secta* or *Lunatia hornii* (Gabb).
9. *Neverita secta* var.
10. *Tritonium* sp. (identical with specimen from Marysville Buttes).
11. *Turris* n. sp.
12. *Turritella.*
13. *Cerithium.*
14. *Eulima?*
15. *Acteon?*

Out of the fifteen species here enumerated, five are identical with Tejon species and six others are very closely related to them.

Not only are the fossils of this area of Pacific coast types but the sediments are similar to those of that area and entirely different from those of the Texas region.

These Alazan shales are overlain directly by the yellow clays of the San Fernando, which are well exposed both west of the Buenavista River near Alazan and eastward between Solis and Meson. Large quantities of fossils are found, including *Orbitoides papyrycœa,* echinoderms, pectens and many species of this as yet unstudied fauna. These yellow clays and sands are the surface material over a large portion of the coast country between Tuxpam and Tampico and its fossils were found at a number of places in this area. It is succeeded by beds of similar composition but later age, which are found only in a narrow belt along the coast itself.

It appears that from the beginning of the Oligocene to the Pliocene there was comparatively little change in the character of the sediments, yellow clays and sands making up the bulk of the deposits. The difference of age is, however, marked by change in faunas and the San Fernando is succeeded by the Tuxpam Miocene, which we found near La Loma.

The time equivalency of the Tejon and Claiborne being probable, we find here apparently contemporaneous deposition of the Atlantic and Pacific types of middle Eocene along what is now the same Gulf coast within a comparatively short distance of each other. While we have not yet had time to study the Tamaulipas range with this idea in view, it appears probable that it may represent a part

of the old barrier between the two basins in which this deposition was carried on.

E. T. Dumble

SOCIETIES AND ACADEMIES

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

The 461st regular and 33d annual meeting of the society was held on April 30, at 8 P.M., in the new National Museum, with the president, Mr. F. W. Hodge, in the chair. The following officers were elected:

President—Mr. G. R. Stetson.

Vice-president—Mr. Francis LaFlesche.

Secretary—Mr. William H. Babcock.

Treasurer—Mr. J. N. B. Hewitt.

Additional Members of the Board of Managers—Messrs. G. C. Maynard, Felix Neumann, E. T. Williams, Drs. E. L. Morgan and John R. Swanton.

The following amendments to the by-laws were adopted:

Art. I., Sec. 1, to read: ". . . Its members shall be classed as Active, Life, Associate, Corresponding and Honorary."

Art. I., Sec. 2, for the words "This sum . . . January" the following to be substituted: "Members elected at any time during the first half of the calendar year shall pay the full amount of their annual dues; those elected during the last half of the year shall pay one half the regular annual dues."

Art. I., Sec. 3, to read: "Associate Members are those who, after having been elected, shall have paid the annual fee. The annual dues for Associate Members shall be Two ($2.00) Dollars for each calendar year, payable in January. This sum entitles them to all rights and privileges of the Society with the exception of the *American Anthropologist.*"

Old sections, 3, 4, 5, 6, 7, to read 4, 5, 6, 7, 8.

Art. I., Sec. 5 (formerly Sec. 4), "Proceedings" to be substituted for "Transactions"; "or associate" to be inserted after "active"; "those classes" to be substituted for "that class."

Art. I., Sec. 6 (formerly Sec. 5), for "Transactions," read "Proceedings."

Art. II., Sec. 4, for "quarterly" read "annual"; for "transactions" read "proceedings."

Art. III., Sec. 1, for "alternate Tuesdays" read "third Tuesdays of each month."

Art. III., Sec. 3, after the words "Board of Managers" insert "the President."

Art. III., Sec. 4, insert after "President," "or at the recommendations of three members of the Board."

Art. VI., Sec. 1, to read: "These by-laws may be amended by a three-fourths vote of the Active, Associate and Life Members present at any officially appointed meeting of the Society, provided notice of the proposed amendment shall have been given, in writing, at a meeting held not less than sixty days previously.

Truman Michelson,
Retiring Secretary

THE PHILOSOPHICAL SOCIETY OF THE UNIVERSITY OF VIRGINIA

At the regular monthly meeting of the Scientific Section of the Philosophical Society, held on April 15, 1912, Professor W. H. Echols presented a paper "On the Flow of Water in Artificial Channels, Clean Pipes." The paper may be summarized briefly as follows:

The paper continued the investigations presented two years previous, by proceeding to another degree of precision with wider range of application. The result gives for Chezy's coefficient of resistance m in the expression for loss of head in clean pipes

$$h = m \frac{L}{r} \frac{V^2}{2g},$$

the value

$$m = \frac{.0094 + \frac{.00003}{Vr}}{1 + \frac{.07\,V}{1 + \left(.015 + \frac{.002}{r}\right) V}} + \frac{.6r}{r + .1}$$

r being the mean hydraulic radius and V the velocity expressed in feet and seconds. This value of m applies to the whole class of clean pipes of easy curvature, of glass, brass, tin, lead, zinc, cast and wrought iron coated, riveted iron coated with asphalt. For straight new asphalt coated cast-iron pipes the velocities from the formula should be increased five per cent. and for wooden stave pipes ten per cent. Four hundred experiments were tabulated in the paper with diameters from one tenth of an inch to eight feet and velocities ranging from two tenths to fifty feet. Three graphical plates accompanied the paper drawn to large scale, giving corresponding values of the coefficients m and c and the relations of V, r and s the hydraulic slope. The paper will be published in the *Transactions* of the society, Bulletin No. 10, Scientific Series.

R. M. Bird,
Secretary